Likewise,

$I_{cy'}$ = the centroidal moment of inertia of the aggregate shape about its y axis, in^4

$$= nI_{cy}{}^{1} + \frac{A}{xres^2}\sum_{i=1}^{n}\left(x_i - .5 - \frac{1}{n}\sum_{i=1}^{n}(x_i - .5)\right)^2 \qquad \textbf{(11a)}$$

where $I_{cy}{}^{1}$ = the centroidal moment of inertia for each pixel about its y axis, in^4

$$= \frac{\left(\frac{1}{yres}\right)\left(\frac{1}{xres}\right)^3}{12} \qquad \textbf{(2a)}$$

This leads to the rest of the section properties such as radius of gyration, product of inertia, principal axes, polar moment of inertia, polar radius of gyration, plastic section modulus, etc. Accuracy is determined by the number of pixels used to define the cross-section and is adjustable by the user. In another permutation of the method, more than one preferred color may be recognized in the digital image to accommodate composite structures.

What is claimed is:

1. A method of approximating section properties of a mechanical element which comprises the steps of:

A. Obtaining or creating a digital image of the cross-section in question.

B. Querying the image file for the x,y coordinates of preferred-color pixels and image resolution.

C. Counting the number of preferred-color pixels

D. Arranging the data

E. Applying standard engineering formulations adapted for use with the arranged data to derive the desired section properties including area, moment of inertia, radius of gyration, product of inertia, principal axes, polar moment of inertia, polar radius of gyration, plastic section modulus, etc.

2. A method as in claim 1 where there is more than one preferred-color and each different color represents a different material and the whole forms a composite structure. Parallel sets of engineering equations may be used to evaluate each different material separately.